

I claim:

1. An electronic package (110), comprising:
a coil (112) of wire bent into a plurality of sequential
loops;
terminals (113, 114) for attaching the coil to a circuit
board; and
means (115) including a surface of material extending over a
plurality of the coils for pick-up using a vacuum probe of a head
of a pick-and-place machine, and adapted for adjusting the
spacing of the loops of the coils after the coil is attached to a
circuit board.

2. A circuit board, comprising:
a dielectric substrate (126):
a plurality of electrically conductive pads (127, 128) for
electrical interconnection with components;
wiring (129) extending between the pads;
one or more coils (122) of wire bent into a plurality of
sequential loops;
multiple terminals (123, 124) extending between each coil
and respective pads;
an electrically conductive material (130, 132) connecting
between the pads and respective terminals;
means (125) including a surface extending over a plurality
of the coils for pick-up with a vacuum head of a pick-and-place
machine, and adapted for adjusting the spacing of the loops of
the coils after the coil is attached to the circuit board.

3. A method for producing circuit boards, comprising:
bending electrically conductive wire (101) to form coils
(102) of multiple sequential loops, extending between connection
terminals (103, 104);

5 providing means (115) including a surface extending over a plurality of the coils for pick-up with a vacuum head of a pick-and-place machine;

feeding a circuit board substrate into a pick-an-place machine, the substrate including electrically conductive pads for connection of components and electrically conductive wiring extending between the pads;

placing connection material (116) onto the pads;

feeding the coils into the pick-and-place machine;

10 picking-up the coils by the surface using a vacuum head of the pick-and-place machine;

placing the coils on the circuit board substrate with the terminals of the coils on the connection material on the pads to form electrically conductive circuits of the circuit board;

connecting and operating apparatus to the circuit board for providing a signal in the circuit board and for monitoring a resulting output signal of the circuit board; and

20 comparing the output signal with one or more predetermined criteria and if the signal does not meet the criteria then adjusting the spacing between the loops for tuning the coil while monitoring the resulting output until the output signal meets one of the predetermined criteria.

25 4. The package of claim 1 in which the surface includes a portion which can be removed from the wire coil without damaging the wire coil so that the spacing between the loops of the coil can be changed to tune the coil.

5. The package of claim 1 in which the surface does not extend onto some of the loops of the coil so that the spacing between the loops can be changed by bending the coil for tuning the coil.

6. The package of claim 1 in which the surface is sufficiently weak or flexible so that the loops on which the surface extends

can be easily bent to adjust the spacing between the loops sufficient for tuning the coil without otherwise damaging the coil.

5

A4
7. the package of claim 1 in which the surface is degraded by exposure to a solvent that can be used to wash the circuit board after the package is connected to the circuit board whereby the loops can be bent to change the spacing between the loops for tuning the coil.

5

8. the package of claim 7 in which the surface is degraded by exposing the surface to water and at least a portion of a material of the surface can be removed by washing in water without damaging the coils.

9. The package of claim 1 in which the surface is degraded by heating the circuit board after which the separation between the loops can be changed by bending the loops for tuning the coil.

10. The package of claim 9 in which the material of the surface flows when exposed to soldering temperature of eutectic Pb/Sn alloy so that after heating the circuit board to reflow the solder at least some of the coils become mechanically separable to allow tuning the coil.

5

11. The package of claim 9 in which the material of the surface sublimates when exposed to soldering temperature of eutectic Pb/Sn alloy so that after reflow soldering the circuit board at least some of the coils become mechanically separable for tuning the coil.

5

12. The package of claim 6 in which the surface is sufficiently soft and arranged so that it can be easily cut using snippers without damaging the coil and then the spacing between two of the

loops of the coil can be adjusted to tune the coil.

13. the package of claim 1 in which:

the material of the surface includes a water soluble material;

the terminals are strait sections of wire extending tangentially to the loops of wire at each end of the coil of wire;

the coil is an air coil without any core;

the wire is nearly pure copper;

the wire is between .05 mm and 1 mm in diameter;

the coils are spaced between 1.1 and 20 times the diameter of the wire;

the coils are spaced between 2 and 10 times the diameter of the wire;

the diameter of the loops is between 10 and 100 times the diameter of the wire; and

the spacing between the loops is adjusted to exceed the manufacturing tolerances of the coil.

14. The circuit board of claim 2 in which the connecting material extending between the terminals and the pads includes a metal soldering alloy.